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IMPELLER FOR CENTRIFUGAL BLOWERS OR PUMPS

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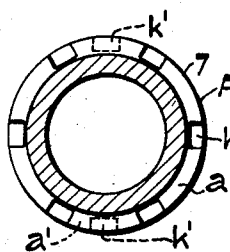
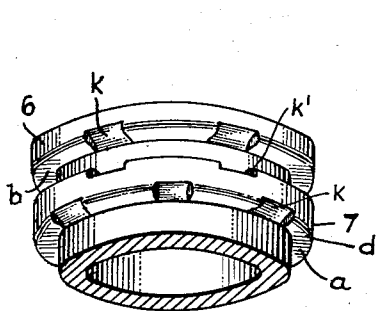
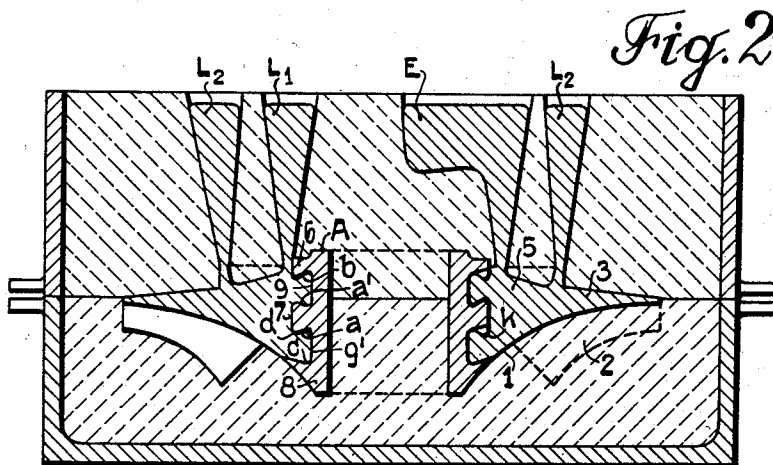
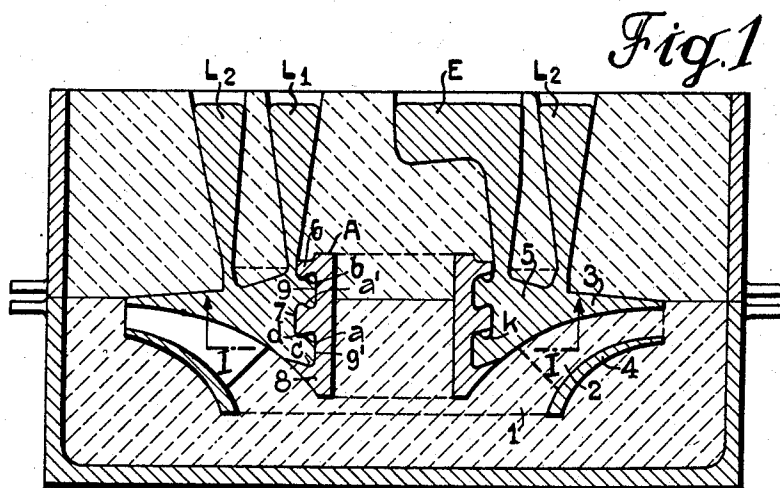


Fig. 3

Fig. 4

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IMPELLER FOR CENTRIFUGAL BLOWERS OR PUMPS

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6 Claims. (Cl. 103—115)

The present invention relates to impellers for centrifugal blowers or pumps and more particularly to a cast impeller wheel wherein a hub part of light metal and carrying the disc and vanes is provided with a hub sleeve or box of a metal of higher rigidity.

The salient object of the invention is to prevent, in the casting of an impeller wheel in a horizontal position, the occlusion of air between the material being cast and an undercut annular side of the hub sleeve or box.

A further object of the invention is to obtain a close adherence of the cast material about the hub sleeve or box with the material being clamped by peripheral annular extensions having undercut walls on the hub sleeve whereby the rigidity of the impeller in the radial and peripheral direction is strengthened materially by the hub sleeve or box.

In the known embodiments of such wheels, the ends are achieved by projecting annular parts which are not provided with undercut sides. The annular sides lie in a plane normal to the axis, are directed outwardly at an angle in such a fashion that in casting about the hub in the horizontal position, the air about the extensions is immediately displaced upwardly. This is objectionable in that the material is frequently not secured to the extensions and in use, centrifugal forces detach the cast material from the hub surface whereupon cracks may occur in the cast material ultimately resulting in the destruction of the impeller.

The present invention provides at least one of the undercut sides of the extensions with radial notches or indentations which originate from the location where the undercut is at a maximum and outside are of a depth which at least corresponds to the degree of the undercut. To augment the clamping engagement of the cast material by the hub sleeve, it is advantageous to provide on both sides of an extension embedded on all sides in cast material, radial notches. The notches of the two sides of an extension can be arranged in mutually offset relation so that the rigidity of the extensions is not weakened.

The impeller is cast in a fashion known per se with the vanes disposed at the bottom in the horizontal position, with the upper end of the hub lying at a higher level than the joined portion of the disc and at such location including a pouring inlet. In this regard, the greatest casting pressure is generated along the hub sleeve and at this zone, the casting material is maintained liquid for the greatest length of time. Due to the fact that the casting material cools and solidifies from the outside, a close adherence of the material about the hub sleeve is effected. The boundary surface of the impeller disc remote from the vanes is constructed at least partly in the shape of a conical surface. At one area between the hub sleeve or box and the outer periphery of the wheel, the conical boundary surface can be sub-divided by an axially protruding annular-shaped rib into two conical parts.

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Reference is made to the attached drawings wherein embodiments of the invention are illustrated and in which the same reference characters denote corresponding parts in the several views.

Fig. 1 is a vertical sectional view of an impeller provided with radial vanes and a cover disc arranged thereupon in a ready cast state in the mold of a mold box.

Fig. 2 is a view similar to Fig. 1 of an impeller wheel of open radial construction.

Fig. 3 is a section taken along the line I—I of Fig. 1.

Fig. 4 is a sectional perspective view of the hub assembly.

Referring to Fig. 1, a centrifugal blower or pump impeller is denoted generally 1 and includes a disc 3, vanes 2, cover disc 4 with the disc 3 having a hub part 5. A hub sleeve A of high grade material is cast to the hub part 5, and, the periphery of the sleeve is provided with annular extensions 6, 7 and 8. The disc 3 and the hub part 5 are of light metal and is cast into depressions 9 and 9' formed by the extensions 6, 7 and 8. It will be noted that the extensions are provided with undercut side walls a, a', b and c in such a fashion as to define bayonet-like connections between the hub sleeve A and the hub part 5 at the location of their highest strains due to centrifugal and other forces during operation of the impeller.

The permissible stresses in the light metal part as a result of these aforementioned forces increase and the stretching compared with a wheel made entirely of light metal decrease. Hence, if the light metal part of the impeller was cast together with the hub sleeve without the use of the present invention, the increasing surface of the liquid casting material would first contact the outer downwardly extending margins d throughout the entire periphery and the air between the undercut side walls and the material being occluded beneath the sides.

Such a drawback is overcome by the invention by the provision of notches k on the side remote from the pouring inlet so that during casting, the air can escape through the notches k upwardly above the level of the casting material and thus, the undercut areas between the extensions as well as the notches can be filled with the casting material. The bases of the notches k originate at the root of the undercut sides or at the point of smallest axial thickness, namely the zone of maximum undercut of extensions 6 and 7. The notches k can extend with their bases more deeply into the extension in an outward direction so that the bases lie in a surface extending obliquely to the axis of the impeller with the inclination being directed upwardly toward the pouring inlet whereby a rigid connection between the hub part and the hub sleeve is effected. To the same end, both side walls a and a' of the extension 7 may be provided with notches, and, the number of notches can be so selected as to provide a stronger connection between the light metal parts and the hub sleeve A.

It will be noted from Figs. 1 and 2 that the casting material is admitted into the mold through a pouring inlet or gate E, and, the air can escape through air vents or channels L1 and L2.

With reference to Fig. 3, it can be seen that side a of the extension 7 includes six notches, and, for a more sturdy connection between the hub part 5 and the hub sleeve A, the side wall a' may also be formed with notches k'. The notches k' are preferably offset peripherally respecting the notches k as indicated by the dotted lines in Fig. 3.

By virtue of the invention, it is possible to cast the impeller in a horizontal position, namely with the axis of rotation being vertically disposed whereby all casting elements lying in the same radial planes during the

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casting cycle are subject to the same casting pressure and have material of the same strength, rigidity and tension, in spite of the rotation resisting notches and the rigid connection with the hub sleeve. During operation, equal stresses occur in all of these radial planes.

In impellers having cover discs on the vanes, it is also possible to cast such wheels in the horizontal position with the disc and vanes located at the bottom of the assembly.

The pouring inlet E and the air vents L1 and L2 are arranged as shown in Figs. 1 and 2, and, at least one inlet is arranged in the area of the hub part 5 at the highest zone of the horizontally disposed form of the light metal components of the wheel. The air escape vents L1 and L2 have at least one surface level and above the vane and the cover disc. The upper area of the impeller mold or form is patterned to rise uniformly from the outside toward the inside (toward the pouring inlet and air escape vents) whereby the air is completely displaced by the casting material simultaneously upwardly, or in other words through the air escape vents to the exterior of the casting form or mold.

It is to be understood that changes and modifications of the invention can be made by one skilled in the art provided such changes or modifications do not depart from the spirit and scope of the appended claims.

I claim:

1. A cast impeller wheel for centrifugal blowers and the like comprising a hub part ending towards the outer periphery in a disc having a vane thereon with the hub part and vane being of light metal, a hub sleeve of a material of higher rigidity than the said light metal, annular extensions in spaced relationship on the periphery of the hub sleeve, said extensions having side walls between adjacent extensions defining several undercut and adjacent notched areas, the metal of the hub part extending into the undercut and notched areas and engaging the side walls of the extensions and the surfaces of the notched areas so that the material of the hub sleeve is firmly anchored to the hub part to resist centrifugal and circumferential forces during rotation of the wheel.

2. A cast impeller wheel for centrifugal blowers and the like comprising a hub part having a vane thereon with the hub part and vane being of light metal, a hub sleeve of a material of higher rigidity than the light metal, annular extensions on the periphery of the hub sleeve defining annular grooves with undercut side walls between adjacent extensions, and several circumferentially spaced substantially radial notches in the undercut side walls of said extensions, the metal of the hub part extending into the grooves and engaging the undercut side walls and the notches.

3. A cast impeller wheel as defined in claim 1 wherein the hub part includes a disc which in part is of conical shape.

4. A cast impeller wheel for centrifugal blowers and the like comprising a hub part having a vane thereon

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with the hub part and vane being of light metal, a hub sleeve of a material of higher rigidity than the light metal, annular extensions on the periphery of the hub sleeve defining annular grooves with undercut side walls between adjacent extensions, several circumferentially spaced substantially radial notches in the undercut side walls of said extensions, metal of the hub part extending into said grooves and engaging said undercut side walls and said notches, and the notches originating at the area most deeply undercut and having exteriorly a depth of at least the degree of the undercut.

5. A cast impeller wheel for centrifugal blowers and the like comprising a hub part ending towards the outer periphery in a disc having a vane thereon with the hub part and vane being of light metal, a hub sleeve of a material of higher rigidity than the said light metal, annular extensions in spaced relationship on the periphery of the hub sleeve, said extensions having side walls between adjacent extensions defining several undercut and adjacent notched areas, the metal of the hub part extending into the undercut and notched areas and engaging the side walls of the extensions and the surfaces of the notched areas so that the material of the hub sleeve is firmly anchored to the hub part to resist centrifugal and circumferential forces during rotation of the wheel, the notched areas being provided on both undercut side walls of an extension embedded on all sides in cast metal.

6. A cast impeller wheel for centrifugal blowers and the like comprising a hub part having a vane thereon with the hub part and vane being of light metal, a hub sleeve of a material of higher rigidity than the light metal, annular extensions on the periphery of the hub sleeve defining annular grooves with undercut side walls between adjacent extensions, several circumferentially spaced substantially radial notches in the undercut side walls of said extensions, metal of the hub part extending into said grooves and engaging said undercut side walls and said notches, the notches originating at the area most deeply undercut and having exteriorly a depth of at least the degree of the undercut, and the notches on one and the same extension being disposed peripherally in mutually offset relationship.

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